ROTHAMSTED RESEARCH

Report for 1935

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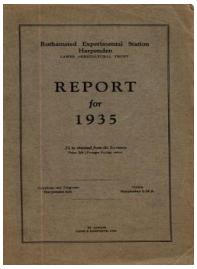

Other Experiments at Rothamsted

Rothamsted Research

Rothamsted Research (1936) *Other Experiments at Rothamsted ;* Report For 1935, pp 174 - 193 **- DOI: https://doi.org/10.23637/ERADOC-1-67**

Conclusions

On both mangolds and wheat the plots ploughed this year and last yielded significantly higher than the cultivated plots, the simared plots being intermediate. On the wheat similar differences appeared on the plots with rotating cultivations, but in the case of the mangolds the differences, though in the same direction, were much smaller.

In addition the shallow cultivations of the continuous part of the experiment gave lower yields than the deep cultivations, this difference being most marked on the cultivated plots and only small on the ploughed plots. No such difference appeared on the plots with rotating cultivations.

The yields of barley did not appear to be affected by the cultivations.

There were no observable differences between nitro-chalk and cyanamide.

THREE COURSE ROTATION EXPERIMENT, ROTHAMSTED, 1933

GREEN MANURE CROPS—GREEN WEIGHTS—TONS PER ACRE

Preceding		Manured 1932-33					Not yet manured				
		Art'ls.	Adco	St. 1.	St. 2	*Mean*	Art'ls.	Adco	St. 1	St. 2	*Mean*
Sugar Beet	Vetches	0.55	0.65	0.56	0.70	*0.62*	0.49	0.84	0.62	0.58	*0.63*
	Rye	1.02	0.78	0.75	0.92	*0.87*	1.29	1.08	0.78	1.11	*1.06*
Potatoes	Vetches	0.32	0.27	0.34	0.41	*0.34*	0.38	0.35	0.28	0.33	*0.34*
	Rye	0.54	0.76	0.30	0.67	*0.57*	0.63	0.47	0.62	0.52	*0.56*
Barley ..	Vetches	0.26	0.20	0.14	0.20	*0.20*	0.19	0.24	0.16	0.24	*0.21*
	Rye	0.37	0.40	0.22	0.40	*0.34*	0.74	0.30	0.44	0.44	*0.48*

NOTE: These figures were omitted from the 1933 report and are included here for the sake of completeness.

https://doi.org/10.23637/ERADOC-1-67

WHEAT

Effect of sulphate of ammonia applied at five different times.

RW—Gt. Harpenden, 1935.

Plan and yields in lb., grain above, straw below.

1	**4** 77.2 166.0	**0** 88.0 147.9	**2** 89.7 184.9	**1** 92.6 188.4	**3** 72.1 197.4	**5** 76.2 181.8	6
	3 93.2 190.8	**4** 95.8 193.0	**0** 94.1 168.0	**5** 93.9 198.8	**1** 91.6 191.8	**2** 67.3 197.1	
W ↑	**5** 90.2 169.2	**2** 87.0 185.6	**3** 86.1 185.8	**4** 85.5 205.2	**0** 93.4 184.8	**1** 68.5 180.8	
	2 72.5 188.5	**3** 76.7 191.8	**1** 96.3 174.0	**0** 95.3 172.4	**5** 95.9 189.8	**4** 78.2 168.3	
	0 84.2 161.1	**1** 96.5 185.0	**5** 98.5 177.8	**2** 81.6 201.7	**4** 90.1 191.1	**3** 81.8 168.0	
31	**1** 77.0 168.0	**5** 91.9 170.6	**4** 95.1 170.0	**3** 86.3 190.5	**2** 82.8 188.4	**0** 60.5 134.8	36

SYSTEM OF REPLICATION : 6 × 6 Latin square.
AREA OF EACH PLOT : 1/40 acre (63.5 lks. × 39.4 lks.)
TREATMENTS : No sulphate of ammonia (**0**) and sulphate of ammonia at the rate of 0.4 cwt. N per acre, applied on Oct. 26 (**1**), Jan. 19 (**2**), Mar. 18 (**3**), Apr. 27 (**4**) and May 24 (**5**).
CULTIVATIONS, ETC. Ploughed : Sept. 15-20. Harrowed : Oct. 24. Drilled : Oct. 26. Harrowed : Oct. 27. Harvested : Aug. 8 and 9. Variety : Victor. Previous crop : Beans.
STANDARD ERRORS PER PLOT : Grain : 2.35 cwt. per acre or 7.67% ; Straw 2.63 cwt. per acre or 4.08%.

Summary of results : cwt. per acre.

	Dates of application of sulphate of ammonia (0.4 cwt. N per acre)					*Mean of all N.*	*St. error*
	No N	Oct. 26	Jan. 19	Mar. 18	Apr. 27	May 24	
GRAIN (±0.960)	30.7	31.1	28.6	29.5	31.1	32.5	*30.6*	*±0.429*
Incr. (*±1.36*)		*+0.4*	*−2.1*	*−1.2*	*+0.4*	*+1.8*	*−0.1*	*±1.05*
STRAW (±1.07)	57.7	64.8	68.2	66.9	65.1	64.8	*66.0*	*±0.478*
Incr. (*±1.51*)		*+7.1*	*+10.5*	*+9.2*	*+7.4*	*+7.1*	*+8.3*	*±1.17*

Conclusions

The average response to sulphate of ammonia was significant for straw, but negligible for grain. The differences due to date of application were not significant in grain ; in straw, however, where the yields rose to a maximum and fell again, the parabolic regression of yield on time of application was significant.

https://doi.org/10.23637/ERADOC-1-67

SPRING OATS

RO—PASTURES, 1935

Soil fumigation experiment. Effect of "cymag," carbon disulphide jelly, chlordinitrobenzene and "seekay"

Plan and yields in lb., grain above, straw centre, weeds below

1	**O** 8.0 9.1 52.1	**2CK** 0.5 0.4 0.1	**1N** 5.1 6.7 14.4	**1CM** 29.4 39.3 6.8	**2CM** 28.0 50.9 2.1	**2S** 27.8 49.8 0.6	**2CK** 1.1 2.7 3.7	**O** 13.8 31.4 17.8	40
	1S 33.1 49.9 3.5	**O** 23.6 35.6 13.5	**O** 9.1 19.1 53.5	**2CM** 32.2 45.0 4.2	**1CK** 0.6 2.1 1.3	**1N** 9.8 17.9 17.3	**1CM** 23.1 40.0 11.7	**O** 11.2 22.3 34.0	
S ↑	**2S** 28.2 44.7 6.1	**1CK** 0.5 1.0 3.5	**O** 19.5 33.6 29.9	**2N** 11.3 20.0 4.7	**O** 9.9 7.2 44.9	**O** 20.7 32.0 17.3	**2N** 8.5 20.9 5.3	**1S** 21.0 37.7 20.8	
	1CK 0.3 0.1 1.1	**O** 6.3 4.8 59.2	**1S** 12.5 20.8 42.4	**2CK** 0.3 0.2 1.4	**2CK** 0.0 0.0 0.5	**O** 11.1 6.5 61.7	**1CK** 0.3 0.3 0.6	**1CM** 25.4 47.2 4.6	
	O 10.6 12.4 35.4	**2N** 4.1 6.5 10.4	**2S** 15.8 23.8 27.6	**1N** 6.3 15.7 21.3	**O** 14.4 30.7 25.4	**2N** 13.2 28.6 4.4	**2S** 27.9 42.1 9.4	**O** 21.5 33.5 17.2	
21	**2CM** 20.4 33.1 19.7	**O** 11.6 25.0 40.6	**1CM** 10.7 22.4 43.4	**O** 6.6 11.6 59.8	**1S** 16.8 43.0 15.2	**1N** 15.2 29.6 11.0	**O** 18.1 31.8 27.0	**2CM** 21.9 53.6 1.5	36

The positions of the blocks in the field were slightly different from those shown above.

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each.
AREA OF EACH PLOT : 1/80 acre (30 lks. × 41.7 lks.).
TREATMENTS : No fumigant (O), single (1) and double (2) dressings of "cymag" (CM), carbon disulphide jelly (S), chlordinitrobenzene (N) and "seekay" (CK), at the following rates of application per acre for the single dressing : 1 CM, 7.5 cwt. ; 1 S, 24.3 cwt. ; 1 N, 2.0 cwt. and 1 CK, 5.0 cwt.
BASAL MANURING : 1 cwt. sulphate of ammonia per acre.
CULTIVATIONS : Ploughed : March 21 and 22. Fumigants ploughed in. Harrowed : March 25 and 26. Rolled : March 26. Drilled : March 26. Harrowed : March 27. Rolled : March 27. Harrowed : May 3. Rolled : May 3. Harvested : August 9. Variety : Marvellous. Previous crop : Spring oats.
SPECIAL NOTE : The ratio of weeds to total oats was determined by sampling at harvesting, two random samples being taken per plot.
STANDARD ERRORS PER PLOT : Grain : 3.38 cwt. per acre or 28.5% ; straw : 6.17 cwt. per acre or 30.4% ; weeds : 5.07 cwt. per acre.

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Summary of Results

	GRAIN : cwt. per acre (±1.69. *Means:* ±*1.19*)				STRAW : cwt. per acre			
	Chlor-dinitro-benzene	Carbon disulph-ide jelly	"Cymag"	"Seekay"	Chlor-dinitro-benzene	Carbon disulph-ide jelly	"Cymag"	"Seekay"
None ..	9.6[1]				15.5			
Single ..	6.5	14.9	15.8	Nil	12.5	27.0	26.6	Nil
Double ..	6.6	17.8	18.3	Nil	13.6	28.7	32.6	Nil
Mean of single and double ..	*6.6*	*16.4*	*17.0*	*Nil*	*13.0*	*27.8*	*29.6*	*Nil*

STANDARD ERROR : (1) ±0.845. No single standard error is applicable to the straw yields.

	WEEDS : cwt. per acre			
	Chlor-dinitro-benzene	Carbon disulph-ide jelly	"Cymag"	"Seekay"
None ..	26.3			
Single ..	11.4	14.6	11.9	Nil
Double ..	4.4	7.8	4.9	Nil
Mean of single and double ..	*7.9*	*11.2*	*8.4*	*Nil*

Conclusions

Carbon disulphide jelly and "cymag" produced significant increases in the yield of grain, "cymag" giving slightly, but not significantly, higher yields than carbon disulphide jelly. In neither case was the falling-off in response at the higher level of dressing significant. The responses were presumably due in part at least to nitrogen, the single dressings of carbon disulphide jelly and "cymag" being equivalent to 37 and 87 lb. nitrogen per acre respectively. Chlordinitrobenzene significantly decreased the yield, but there was no apparent difference between the effects of the single and double dressings. There was practically no crop on the plots receiving "seekay," due to the short interval between application of the fumigants and the drilling of the seed.

No relation was found between the yields and the numbers of cysts at the second eelworm count after eliminating treatment effects.

The results for straw were similar to those for grain.

All fumigants produced large decreases in the weight of weeds, with a further decrease with the double dressing. The crop was unusually weedy.

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Plan and numbers of cysts per 400 gms. of soil, first count above, second below

1	O 269 466	2CK 283 280	1N 252 398	1CM 212 386	2CM 95 199	2S 127 166	2CK 80 142	O 134 590	40
	1S 138 194	O 100 219	O 197 421	2CM 263 379	1CK 107 236	1N 89 332	1CM 41 176	O 74 137	
	2S 282 372	1CK 230 256	O 216 708	2N 145 304	O 88 356	O 25 212	2N 42 308	1S 62 221	
	1CK 124 268	O 211 505	1S 194 433	2CK 222 408	2CK 193 292	O 209 352	1CK 109 132	1CM 153 454	
	O 102 363	2N 193 561	2S 128 311	1N 42 222	O 29 254	2N 9 92	2S 17 28	O 19 106	
21	2CM 162 365	O 191 563	1CM 107 415	O 67 338	1S 23 80	1N 19 114	O 44 268	2CM 48 298	36

NOTE : First count : Mar. 8. Second count : Oct. 14. Two random samples of about 100 gms. of soil each were taken per half plot.

STANDARD ERRORS PER PLOT (400 gms. of soil) : First count : sampling error 28.1, or 21.9%. Experimental error 58.1 or 45.2%. Second count : sampling error 74.3, or 24.3%. Experimental error : 123.0, or 40.2%. Second count adjusted for first count : experimental error 84.4, or 27.6%.

Summary of results

	Second count, adjusted for first count (±42.2. *Means:* ±29.8)			
	Chlordinitrobenzene	Carbon disulphide jelly	"Cymag"	"Seekay"
None		374[1]		
Single ..	310	270	358	201
Double ..	365	203	289	178
Mean of single and double ..	*338*	*236*	*324*	*190*

STANDARD ERROR (:) (1) ±21.1.

Conclusions

Carbon disulphide jelly and "seekay" produced significant decreases in the number of cysts, the falling-off in the decrease at the higher level of dressing being small for carbon disulphide jelly and not quite significant for "seekay." The decreases due to chlordinitrobenzene and "cymag" were not significant and were significantly less than those due to the other two fumigants.

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POTATOES

Effect of dung ploughed in and applied in the bouts, and of sulphate of ammonia and minerals broadcast before bouting and applied in the bouts.

RP—Little Hoos, 1935

Total produce in lb. above, percentage ware below

1												12
	Dp A_2 N —	— A_1 —PK	Dp A_2 — PK	Dp A_1 — —	Dp A_2 — —	Db A_2 N —	— A_1 — PK	Db A_1 — —	— A_2 — —	Dp A_1 — —	Db A_1 N PK	— A_1 — PK
	284	216	272	201	174	269	154	218	120	218	187	167
	81.7	69.9	75.2	74.9	71.3	77.1	57.5	72.7	54.6	73.2	69.5	62.3
	Db A_2 — —	Dp A_1 N PK	Db A_2 N PK	— A_1 N —	— A_2 N PK	Dp A_2 N PK	Db A_1 N PK	Db A_2 — PK	Dp A_1 N PK	Db A_1 — —	Db A_2 N —	Dp A_2 N —
	232	326	418	130	293	314	283	249	250	204	262	221
N	76.3	82.8	82.8	58.8	72.4	78.0	76.3	76.3	79.0	74.8	78.4	71.0
↑	Db A_1 N —	— A_2 N PK	— A_2 — —	Db A_1 — PK	Dp A_1 N —	— A_1 N —	Dp A_1 — PK	— A_2 — —	Dp A_2 — PK	Db A_2 — PK	— A_1 N —	— A_2 N PK
	300	337	214	280	260	135	212	141	226	248	132	288
	78.2	78.9	68.0	77.1	77.5	50.7	71.9	55.3	71.7	75.4	45.4	70.0
	Db A_2 N —	Dp A_2 N PK	— A_2 N —	Dp A_2 — —	Dp A_2 N —	Dp A_1 N PK	Dp A_1 — —	Db A_1 N —	Db A_1 — PK	Db A_1 N —	— A_1 — —	Dp A_2 — —
	298	322	112	206	256	260	171	274	281	355	128	202
	79.2	80.9	42.8	77.7	76.2	76.5	70.5	74.1	77.9	81.1	43.4	71.0
	Dp A_1 — PK	Db A_1 — —	— A_1 — —	Db A_1 N PK	Dp A_2 — PK	Db A_1 — PK	— A_1 — —	— A_2 — PK	Dp A_2 N PK	Db A_2 N PK	— A_2 N —	— A_1 N PK
	212	229	129	296	198	217	83	210	369	402	90	245
	75.9	73.6	54.6	77.7	72.2	69.1	36.1	68.6	82.6	83.4	28.9	72.2
	— A_2 — PK	Db A_2 — PK	— A_1 N PK	Dp A_1 N —	— A_1 N PK	Db A_2 N PK	Db A_2 — —	— A_2 N —	Dp A_1 N —	— A_2 — PK	Db A_2 — —	Dp A_1 — PK
	195	307	275	267	261	401	252	108	296	218	277	265
61	71.8	83.1	75.3	83.9	74.9	82.5	75.2	38.0	81.2	64.0	77.4	74.7

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SYSTEM OF REPLICATION : 6 randomised blocks of 12 plots each. Certain high order interactions partially confounded with block differences.

AREA OF EACH PLOT : 1/50 acre (63.5 lks. × 31.5 lks., 9 rows per plot, of which the 7 middle rows were harvested).

TREATMENTS : All combinations of :

Dung { None (—) / Ploughed in (Dp) / In the bouts (Db) } × Artificials { broad cast before bouting (A_1) / Inthe bouts (A_2) } × Sulph. Amm. { None (—) / 0.8 cwt. N. (N) } × Super. and mur. pot. { None (—) / 0.8 cwt. P_2O_5 and 1.6 cwt. K_2O. (PK) }

CULTIVATIONS, ETC. : Dung applied to Dp plots : Feb. 19. Ploughed : Feb. 19-22. Artificials applied to A_1 plots : March 25. Tractor cultivated : March 26. Horse cultivated : March 27. Horse rolled : April 1. Ridged : April 2 and 3. Dung applied to Db plots : April 4. Applied artificials to A_2 plots : April 12. Potatoes planted : April 13-15. Rolled and harrowed ridges : May 7. Harrowed ridges : May 16. Re-ridged : May 24. Grubbed : June 25. Hand-hoed : July 10-11. Earthed up : July 13-14. Lifted : October 16-18. Variety : Ally. Previous crop : Wheat. Potatoes passed through a $1\frac{3}{4}$ inch riddle to determine the percentage ware.

SPECIAL NOTE : The potatoes were stored in a clamp from harvest till February, the different replicates of the treatments being bulked and arranged in random order in the clamp.

STANDARD ERRORS PER PLOT : Total produce : 0.660 tons per acre or 9.67% ; Percentage ware : 3.36.

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Summary of Results : block effects eliminated

		No dung. No super or mur.pot.	No dung. Super and mur. pot.	Dung. No super or mur.pot.	Dung. Super and mur. pot.
	TOTAL PRODUCE : tons per acre				
No sulph. amm.	Artificials broadcast before bouting	3 90[2]	5.36[1]	6.18[3]	6.78[2]
	Artificials in the bouts ..		5.75[1]		7.42[2]
Sulph. amm.	Artificials broadcast before bouting	4.02[1]	7.26[1]	8.14[2]	7.91[2]
	Artificials in the bouts ..	2.75[1]	9.00[1]	7.66[2]	10.41[2]
	PERCENTAGE WARE				
No sulph. amm.	Artificials broadcast before bouting	52.0[5]	63.8[4]	74.1[6]	74.0[5]
	Artificials in the bouts ..		67.5[4]		76.2[5]
Sulph. amm.	Artificials broadcast before bouting	52.2[4]	73.5[4]	78.9[5]	77.4[5]
	Artificials in the bouts ..	36.0[4]	74.4[4]	77.7[5]	81.2[5]

STANDARD ERRORS : ([1]) ±0.381, ([2]) ±0.269, ([3]) ±0.190, ([4]) ±1.94, ([5]) ±1.37, ([6]) ±0.970. These standard errors apply to comparisons which are not confounded.

Effect of time of application of dung

	No Artificials	Sulph. amm. b'cast before bouting	Sulph. amm. in the bouts	Super and mur. pot. b'cast before bouting	Super and mur. pot. in the bouts	Sulph. amm., super and mur. pot. b'cast before bouting	Sulph. amm., super and mur. pot. in the bouts	*Mean*
	TOTAL PRODUCE : tons per acre (±0.381)							
Dung ploughed in	5.60[1]	7.87	7.28	6.59	6.66	8.00	9.61	*7.15*[2]
Dung in the bouts	6.76[1]	8.89	7.93	7.44	7.69	7.33	11.68	*8.06*[2]
Difference ..	*+1.16*[3]	*+1.02*[4]	*+0.65*[4]	*+0.85*[4]	*+1.03*[4]	*−0.67*[4]	*+2.07*[4]	*+0.91*
	PERCENTAGE WARE : (±1.94)							
Dung ploughed in	73.1[5]	80.9	76.3	74.2	73.0	79.4	80.5	*76.3*[6]
Dung in the bouts	75.0[5]	77.8	78.2	74.7	78.3	74.5	82.9	*77.0*[6]
Difference ..	*+1.9*[7]	*−3.1*[8]	*+1.9*[8]	*+0.5*[8]	*+5.3*[8]	*−4.9*[8]	*+2.4*[8]	*+0.7*

STANDARD ERRORS : ([1]) ±0.269, ([2]) ±0.135, ([3]) ±0.381, ([4]) ±0.539, ([5]) ±1.37, ([6]) ±0.686, ([7]) ±1.94, ([8]) ±2.74.

Conclusions : Yields

Dung applied in the bouts gave consistently 0.9 tons per acre more than dung ploughed in (in November).

There was no response to sulphate of ammonia applied alone, but in the presence of phosphate and potash or dung or both there was a response of 2.1 tons per acre.

In addition to producing a response to sulphate of ammonia, dung gave increases of 3.4 tons per acre in the absence of potash and phosphate and 1.3 tons per acre in their presence.

Sulphate of ammonia, in the complete fertiliser, gave a larger response when applied in the bouts than when broadcast before bouting, the increases being 3.1 and 1.9 tons per acre respectively. This was the only large effect of time of application of the artificials.

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The response to potash and phosphate depended on the other manures present in the way indicated above; in particular the response was 3.2 tons per acre in the absence of dung, and 1.1 tons per acre in the presence of dung, and was greater when the potash and phosphate were applied in the bouts than when they were broadcast before bouting.

The effects of the treatments on percentage ware were in general similar to those on yield.

Summary of results: effect of storing in clamp

	Artificials.	No dung.		Dung.	
		No super or mur.pot.	Super and mur. pot.	No super or mur.pot.	Super and mur. pot.
		Percentage loss in weight after storing.			
No sulph. amm.	Broadcast before bouting ..	4.8	6.3	4.4	4.4
	In the bouts		2.4		5.5
Sulph. amm.	Broadcast before bouting ..	1.5	3.8	2.2	7.2
	In the bouts	1.6	1.2	6.8	6.4
		Percentage good after storing.			
No sulph.amm.	Broadcast before bouting ..	95.2	90.4	92.2	94.4
	In the bouts		94.1		91.5
Sulph. amm.	Broadcast before bouting ..	94.3	90.6	93.3	87.8
	In the bouts	98.5	95.7	94.7	93.8

Effect of time of application of dung

	No Artificials	Sulph. amm.		Super and mur. pot.		Sulph. amm. super and mur. pot.		*Mean*
		b'cast before bouting	in the bouts	b'cast before bouting	in the bouts	b'cast before bouting	in the bouts	
	Percentage loss in weight after storing.							
Dung ploughed in	5.4	3.2	8.5	4.5	6.9	7.4	8.3	*6.2*
Dung in the bouts	3.3	1.2	5.2	4.4	4.1	7.0	4.4	*4.1*
Difference ..	*−2.1*	*−2.0*	*−3.3*	*−0.1*	*−2.8*	*−0.4*	*−3.9*	*−2.1*
	Percentage good after storing.							
Dung ploughed in	93.4	93.6	94.6	94.9	94.3	90.2	95.0	*93.7*
Dung in the bouts	91.0	93.0	94.8	93.8	88.7	85.4	92.5	*91.3*
Difference ..	*−2.4*	*−0.6*	*+0.2*	*−1.1*	*−5.6*	*−4.8*	*−2.5*	*−2.4*

Conclusions: Storing

The average loss in weight on storing was 4 per cent. The loss was about 2 per cent. greater where dung was ploughed in than where it was applied in the bouts. There were no other treatment effects.

About 7 per cent. of the potatoes went bad on storing. Dung increased the percentage going bad, by 2 per cent. the increase being consistently greater with dung in the bouts than with dung ploughed in. Minerals increased the percentage going bad by 0.8 per cent. Sulphate of ammonia had on the average little effect, though there are indications that the percentage going bad was higher when the sulphate of ammonia was broadcast before bouting than when it was applied in the bouts.

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SUGAR BEET

Effect of sowing date, spacing of rows and of sulphate of ammonia

RS—LITTLE HOOS, 1935

Plan and yields in lb.

				Roots (dirty)	Tops	Sugar per cent.	Plant number					Roots (Dirty)	Tops	Sugar per cent.	Plant number	
27	1	S_{15}	N_2	566	348	16.70	833		2	S_{20}	N_1	522	359	16.79	527	54
	3	S_{10}	N_2	537	482	16.50	1,378		2	S_{10}	—	579	371	16.88	1,333	
	1	S_{10}	N_1	553	314	17.00	1,420		2	S_{15}	N_2	542	372	16.39	764	
	3	S_{15}	—	362	244	17.05	914		1	S_{10}	N_2	686	444	16.18	1,377	
	1	S_{20}	—	398	220	16.50	558		3	S_{15}	—	434	286	16.88	875	
	2	S_{20}	N_2	531	400	16.79	507		1	S_{15}	N_1	626	382	16.53	799	
	2	S_{15}	N_1	493	292	17.05	789		1	S_{20}	—	489	257	16.21	541	
	2	S_{10}	—	501	294	16.85	1,171		3	S_{20}	N_2	458	432	16.39	530	
	3	S_{20}	N_1	425	353	16.36	510		3	S_{10}	N_1	622	453	16.39	1,424	
	3	S_{10}	N_1	522	359	16.53	1,391		3	S_{15}	N_1	585	426	16.43	855	
	1	S_{10}	—	486	265	16.79	1,453		3	S_{10}	N_2	688	648	16.42	1,399	
	1	S_{15}	N_1	500	284	17.05	878	E	2	S_{20}	N_2	566	368	16.30	542	
	1	S_{20}	N_2	527	342	15.98	566	↑	1	S_{15}	N_2	656	436	16.10	796	
	2	S_{10}	N_2	636	466	16.79	1,315		3	S_{20}	—	486	324	17.08	539	
	3	S_{20}	—	477	333	16.56	513		1	S_{20}	N_1	520	298	16.36	520	
	3	S_{15}	N_2	486	486	16.59	783		1	S_{10}	—	566	303	16.47	1,351	
	2	S_{15}	—	448	312	16.62	836		2	S_{10}	N_1	594	344	16.33	1,348	
	2	S_{20}	N_1	499	300	16.44	531		2	S_{15}	—	487	272	16.44	802	
	3	S_{20}	N_2	464	396	16.21	526		2	S_{10}	N_2	754	486	16.44	1,286	
	3	S_{10}	—	460	392	16.59	1,441		3	S_{15}	N_2	578	487	16.42	859	
	2	S_{10}	N_1	516	355	16.47	1,361		3	S_{10}	—	524	358	16.27	1,445	
	3	S_{15}	N_1	458	378	16.96	871		2	S_{15}	N_1	393	220	16.04	744	
	1	S_{15}	—	467	261	16.30	843		1	S_{20}	N_2	484	248	16.56	549	
	2	S_{15}	N_2	520	424	16.13	688		1	S_{15}	—	515	276	16.33	821	
	2	S_{20}	—	440	260	16.65	556		2	S_{20}	—	424	234	17.05	542	
	1	S_{10}	N_2	714	538	16.85	1,428		3	S_{20}	N_1	458	328	16.68	578	
1	1	S_{20}	N_1	468	313	16.70	586		1	S_{10}	N_1	624	344	16.27	1,277	28

SYSTEM OF REPLICATION : 6 randomised blocks of 9 plots each. Certain second order interactions partially confounded with block differences.

AREA OF EACH PLOT (after rejecting edge rows) : 10-inch spacing : 0.02083 acre ; 15-inch spacing : 0.01875 acre ; 20-inch spacing : 0.01667 acre. Plots actually 15.2 lks. × 164.5 lks. rows.

TREATMENTS : All combinations of :

Sowing dates		Spacing		Sulph. amm.	
March 15	(1)	10-inch	(S_{10})	None (—)	
April 18	(2)	15-inch	(S_{15})	(0.3 cwt. N)	(N_1)
May 16	(3)	20-inch	(S_{20})	(0.6 cwt. N)	(N_2)

BASAL MANURING : 10 tons dung per acre. Superphosphate at the rate of 0.5 cwt. P_2O_5 per acre and 30% potash manure salt at the rate of 1.0 cwt. K_2O per acre.

CULTIVATIONS, ETC. : Applied basal dressing of artificials : January 21. Ploughed : January 21-22. Harrowed and sulphate of ammonia applied to 1st sowing : March 14. Harrowed, rolled and drilled, 1st sowing : March 15. Rolled : March 16. Harrowed, 2nd sowing : April 13. Applied sulphate of ammonia to 2nd sowing : April 15. Harrowed : April 17. Harrowed, rolled and drilled, 2nd sowing : April 18. Harrowed, rolled, sulphate of ammonia applied and drilled, 3rd sowing : May 16. Harrowed and rolled : May 17. Hoed narrow and wide rows : May 18. Hoed narrow rows : May 23. Singled, 1st sowing : May 30. Singled, 2nd sowing : June 11-17. Hoed all wide rows : June 14. Singled, 3rd sowing : June 24-July 4. Hoed : July 8-19. Lifted : November 8-23. Variety : Kleinwanzleben E. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Roots (washed) : 0.873 tons per acre or 7.85%. Tops : 0.977 tons per acre or 11.5%. Sugar percentage : 0.288. Plant number : 2.45 thousands per acre or 5.01%. Mean dirt tare : 10 inch spacing : 0.122 ; 15 inch spacing : 0.116 ; 20 inch spacing : 0.101. There was a severe attack of Heart Rot. See p. 25.

https://doi.org/10.23637/ERADOC-1-67

Yields of Separate Treatments (block effects eliminated)

ROOTS (washed) : tons per acre

Sowing date	Sulph. amm. per acre None			Sulph. amm. per acre 0.3 cwt. N.			Sulph. amm. per acre 0.6 cwt. N.		
	Spacing (inches)			Spacing (inches)			Spacing (inches)		
	10	15	20	10	15	20	10	15	20
March 15 ..	9.75	10.42	10.74	11.37	11.91	11.52	13.01	12.71	12.49
April 18	10.22	9.69	10.48	10.08	9.63	12.36	13.39	11.02	13.06
May 16	9.35	8.43	11.46	10.83	10.61	10.93	11.37	11.51	10.94

Main effects. Interactions of sulphate of ammonia with spacing and sowing dates.

	Spacing (inches)			Sowing Dates			*Mean*	*Increase*
	10	15	20	Mar. 15	Apl. 18	May 16		
ROOTS (washed) : tons per acre ($\pm$0.356. *Means : $\pm$0.206. Increases : $\pm$0.291*)								
0.0 cwt. N ..	9.77	9.51	10.89	10.30	10.13	9.75	*10.06*	
0.3 cwt. N ..	10.76	10.72	11.60	11.60	10.69	10.79	*11.03*	*+0.97*
0.6 cwt. N ..	12.59	11.75	12.16	12.74	12.49	11.27	*12.17*	*+1.14*
Mean	*11.04*	*10.66*	*11.55*	*11.55*	*11.10*	*10.60*	*11.08*	
Increase ..		*—0.38*	*+0.51*		*—0.45*	*—0.95*		
TOPS : tons per acre ($\pm$0.399. *Means : $\pm$0.230. Increases : $\pm$0.325*)								
0.0 cwt. N ..	7.08	6.55	7.27	6.29	6.90	7.72	*6.97*	
0.3 cwt. N ..	7.75	7.86	8.71	7.72	7.47	9.13	*8.11*	*+1.14*
0.6 cwt. N ..	10.94	10.13	9.76	9.25	9.99	11.59	*10.28*	*+2.17*
Mean	*8.59*	*8.18*	*8.58*	*7.75*	*8.12*	*9.48*	*8.45*	
Increase ..		*—0.41*	*—0.01*		*+0.37*	*+1.73*		
SUGAR PERCENTAGE ($\pm$0.118. *Means : $\pm$0.0681. Increases : $\pm$0.0963*)								
0.0 cwt. N ..	16.64	16.60	16.68	16.44	16.75	16.74	*16.64*	
0.3 cwt. N ..	16.50	16.68	16.56	16.65	16.52	16.56	*16.58*	*—0.06*
0.6 cwt. N ..	16.53	16.39	16.37	16.40	16.47	16.44	*16.44*	*—0.14*
Mean	*16.56*	*16.56*	*16.54*	*16.50*	*16.58*	*16.58*	*16.55*	
Increase ..		*0.00*	*—0.02*		*+0.08*	*+0.08*		
TOTAL SUGAR : cwt. per acre								
0.0 cwt. N ..	32.5	31.5	36.3	33.9	33.9	32.6	*33.5*	
0.3 cwt. N ..	35.5	35.8	38.4	38.6	35.3	35.7	*36.5*	*+3.0*
0.6 cwt. N ..	41.6	38.5	39.8	41.8	41.2	37.0	*40.0*	*+3.5*
Mean	*36.5*	*35.3*	*38.2*	*38.1*	*36.8*	*35.1*	*36.7*	
Increase ..		*—1.2*	*+1.7*		*—1.3*	*—3.0*		
PLANT NUMBER : thousands per acre ($\pm$1.00. *Means : $\pm$0.577. Increases : $\pm$0.816*)								
0.0 cwt. N ..	65.6	45.2	32.5	48.2	45.6	49.5	*47.8*	
0.3 cwt. N ..	65.8	43.9	32.5	47.5	45.9	48.7	*47.4*	*—0.4*
0.6 cwt. N ..	65.5	42.0	32.2	48.0	44.2	47.4	*46.5*	*—0.9*
Mean	*65.6*	*43.7*	*32.4*	*47.9*	*45.2*	*48.5*	*47.2*	
Increase ..		*—21.9*	*—33.2*		*—2.7*	*+0.6*		

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Interaction of Spacing and Sowing Dates

Sowing Date	Spacing (inches) 10	15	20	Spacing (inches) 10	15	20
	ROOTS (washed) : tons per acre (±0.356)			TOPS : tons per acre (±0.399)		
March 15	11.38	11.68	11.58	7.88	7.88	7.49
April 18	11.23	10.11	11.97	8.27	7.51	8.58
May 16	10.52	10.18	11.11	9.61	9.15	9.67
	SUGAR PERCENTAGE : (±0.118)			TOTAL SUGAR : cwt. per acre		
March 15	16.59	16.50	16.38	37.7	38.6	38.0
April 18	16.63	16.44	16.67	37.3	33.3	39.8
May 16	16.45	16.72	16.55	34.6	34.0	36.8

Sowing Date	Spacing (inches) 10	15	20
	PLANT NUMBER : thousands per acre (±1.00)		
March 15 ..	66.4	44.2	33.2
April 18 ..	62.5	41.1	32.0
May 16 ..	67.8	45.8	32.0

Conclusions : Yields

Sulphate of ammonia significantly increased the yields of roots and tops and significantly decreased the sugar percentage, the net result being an increase in total sugar for the double dressing (0.6 cwt. N. per acre) of 6.5 cwt. per acre. The response in roots decreased as the width of spacing increased, the interaction between sulphate of ammonia and spacing being significant.

Apart from this and the effect on plant number, spacing produced no significant effect.

There was a significant reduction in roots and a significant increase in tops with the later sowing dates, but no effect on sugar percentage. Plant number was significantly lower at the second sowing than at the first or last.

Bolters : First sowing date

	Spacing (inches) 10	15	20	*Mean*	*Increase*
	PERCENTAGE OF BOLTERS				
0.0 cwt. N ..	10.07	12.96	15.86	*12.96*	
0.3 cwt. N ..	12.94	19.98	27.12	*20.01*	*+7.05*
0.6 cwt. N ..	21.58	21.41	23.89	*22.29*	*+2.28*
Mean	*14.86*	*18.12*	*22.29*	*18.42*	
Increase ..		*+3.26*	*+4.17*		

	Average sugar percentage	Average weight of root lb.
Bolters	16.15	0.476
Normal	16.49	0.613

Conclusions : Bolters

About 18 per cent. of the plants sown at the earliest date, March 15, bolted. There was practically no bolting with the later sowings.

The average weight of a bolter was about 20 per cent. smaller than that of a good root. The sugar percentage was also slightly smaller. Sulphate of ammonia increased the percentage of bolters. The percentage also increased as the width of spacing increased.

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SUGAR BEET

Effects of agricultural salt, applied before winter ploughing and at sowing, of dung, of additional heavy rolling of the seed-bed, and of normal and intensive inter-row cultivation

RS—Little Hoos, 1935

Plan and yields in lb.

		Roots (dirty)	Tops	Sugar per cent.	Plant number			Roots (dirty)	Tops	Sugar per cent.	Plant number.	
78	— — — C	361	370	16.36	387		Na_2 D — C	535	436	16.91	530	102
	Na_1 D R —	588	444	16.83	571		Na_1 — — C	502	479	15.98	465	
	Na_2 D — C	507	368	17.62	567		Na_1 — R —	436	394	16.44	424	
	— D — —	519	404	17.26	601		— D — C	494	457	16.33	447	
	Na_2 — — —	498	350	16.82	517		— — R C	401	390	17.14	490	
	Na_2 D R —	526	354	17.51	563		— D R —	469	406	16.73	509	
	Na_2 — R C	526	374	17.35	525		Na_2 — — —	461	402	16.65	519	
	Na_1 — R C	519	334	17.48	527		Na_2 D R —	515	390	17.11	580	
	— D R C	584	418	17.48	576		Na_1 D R C	522	371	17.14	598	
	Na_1 — — —	557	356	17.52	527		Na_2 — R C	458	355	17.05	529	
	Na_1 D — C	632	426	17.26	583	E	— — — —	423	375	17.02	511	
	— — R —	522	443	16.84	529	↑	Na_1 D — —	544	418	16.50	581	
	— — — —	531	471	17.34	508		Na_1 — — —	497	346	17.02	539	
	Na_2 — — C	594	444	17.18	529		Na_2 — — C	522	433	16.79	530	
	Na_1 D — —	635	417	17.48	607		Na_1 D — C	565	416	16.96	573	
	Na_2 — R —	556	330	16.96	466		— — R —	415	317	16.98	478	
	— D — C	627	384	17.18	591		Na_1 D R —	529	372	17.22	539	
	Na_1 D R C	599	386	17.46	556		— — — C	451	370	16.59	453	
	Na_1 — — C	534	332	17.70	520		Na_2 D R C	488	334	16.82	543	
	Na_1 — R —	539	326	17.12	486		— D R C	524	354	16.93	564	
	— — R C	526	376	17.34	455		Na_1 — R C	482	340	17.66	476	
	Na_2 D R C	591	378	17.72	529		Na_2 — R —	441	304	16.88	462	
	Na_2 D — —	555	318	17.40	566		— D — —	486	370	16.53	534	
55	— D R —	535	404	16.89	514		Na_2 D — —	498	365	17.57	534	79

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each. Certain high order interactions are partially confounded with block differences.

AREA OF EACH PLOT (after rejecting edge rows) : 1/56 acre. Plots actually 1/40 acre (17.7 lks. x 141.2 lks.).

TREATMENTS : All combinations of :

(*a*) No salt (—), agricultural salt at the rate of 4 cwt. NaCl per acre applied before ploughing in winter (Na_1), and agricultural salt applied before sowing (Na_2).
(*b*) No dung (—), and dung at the rate of 10 tons per acre applied before winter ploughing (D).
(*c*) Ordinary rolling of seed-bed (—), and ordinary rolling + additional heavy rolling (R).
(*d*) Normal (—), and normal + intensive inter-row cultivation with motor hoe at 10-daily intervals (C).

BASAL MANURING: 0.6 cwt. N per acre as sulphate of ammonia, applied at seeding, 1.0 cwt. K_2O per acre as muriate of potash (high grade), and 0.5 cwt. P_2O_5 per acre as superphosphate applied before ploughing in winter.

CULTIVATIONS, ETC. : Applied dung : Jan. 18 and 22. Applied winter artificials : Jan. 22. Ploughed : Jan. 23-26. Cultivated : April 18. Rolled, harrowed and applied artificials : April 29. Seed sown : April 29. Rolled (heavy roll plots) : May 9. Horse hoed : June 14. Singled : June 14-17. Motor hoed " Intensive " plots : June 29, July 10 and 22. Motor cultivated " Intensive " plots : July 30 and Aug. 9. Hand hoed : July 9 and 10. Horse hoed : July 18th. Lifted : Nov. 25-29. Variety : Kleinwanzleben E. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : (Roots washed) : 0.692 tons per acre or 5.98%. Tops : 0.936 tons per acre or 9.77%. Sugar percentage : 0.296. Plant number : 1.78 thousands per acre or 6.06%. Mean dirt tare : 0.1048

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Responses to Treatments

MEAN YIELDS : Roots (washed) : *11.57* tons ; Tops : *9.58* tons ; Sugar percentage : *17.06* ; Total sugar : *39.5* cwt. ; Plant number : *29.4* thousands.

	Mean response	Salt		Dung		Rolling		Cultivation	
		Absent	Present	Absent	Present	Ordinary	Additional	Ordinary	Intensive
ROOTS (washed) : tons per acre									
Salt	*+0.85*[1]	—	—	+1.20[2]	+0.49[2]	+1.19[2]	+0.50[2]	+0.82[2]	+0.90[2]
Dung	*+1.23*[5]	+1.70[3]	+1.00[4]	—	—	+1.25[6]	+1.22[6]	+0.99[6]	+1.48[6]
Rolling	*−0.22*[5]	+0.24[3]	−0.45[4]	−0.20[6]	−0.24[6]	—	—	−0.24[6]	−0.20[6]
Intensive cultivation ..	*+0.25*[5]	+0.20[3]	+0.28[4]	+0.01[6]	+0.50[6]	+0.23[6]	+0.28[6]	—	—
St. errors ..	(1) ±0.212, (2) ±0.300, (3) ±0.346, (4) ±0.245, (5) ±0.199, (6) ±0.282.								
TOPS : tons per acre									
Salt	*−0.41*[1]	—	—	−0.51[2]	−0.31[2]	−0.15[2]	−0.67[2]	−0.77[2]	−0.05[2]
Dung	*+0.39*[5]	+0.26[3]	+0.46[4]	—	—	+0.10[6]	+0.68[6]	+0.52[6]	+0.27[6]
Rolling	*−0.64*[5]	−0.29[3]	−0.82[4]	−0.93[6]	−0.35[6]	—	—	−0.23[6]	−1.05[6]
Intensive cultivation ..	*+0.26*[5]	−0.22[3]	+0.50[4]	+0.38[6]	+0.14[6]	+0.67[6]	−0.15[6]	—	—
St. errors ..	(1) ±0.287, (2) ±0.406, (3) ±0.468, (4) ±0.331, (5) ±0.270, (6) ±0.382.								
SUGAR PERCENTAGE									
Salt	*+0.19*[1]	—	—	+0.09[2]	+0.30[2]	+0.25[2]	+0.13[2]	+0.11[2]	+0.27[2]
Dung	*+0.11*[5]	−0.04[3]	+0.18[4]	—	—	+0.17[6]	+0.05[6]	+0.12[6]	+0.10[6]
Rolling	*+0.13*[5]	+0.21[3]	+0.09[4]	+0.19[6]	+0.07[6]	—	—	−0.14[6]	+0.39[6]
Intensive cultivation ..	*+0.07*[5]	−0.03[3]	+0.13[4]	+0.08[6]	+0.06[6]	−0.19[6]	+0.34[6]	—	—
St. errors ..	(1) ±0.0909, (2) ±0.128, (3) ±0.148, (4) ±0.105, (5) ±0.0857, (6) ±0.121								
TOTAL SUGAR : cwt. per acre									
Salt	*+3.3*	—	—	+4.2	+2.4	+4.7	+2.0	+3.0	+3.6
Dung	*+4.4*	+5.6	+3.8	—	—	+4.6	+4.3	+3.6	+5.2
Rolling	*−0.4*	+1.3	−1.3	−0.3	−0.6	—	—	−1.1	+0.2
Intensive cultivation ..	*+1.0*	+0.6	+1.2	+0.2	+1.8	+0.4	+1.7	—	—
PLANT NUMBER : thousands per acre									
Salt	*+1.3*[1]	—	—	+1.4[2]	+1.2[2]	+2.2[2]	+0.5[2]	+0.4[2]	+2.2[2]
Dung	*+3.5*[5]	+3.7[3]	+3.4[4]	—	—	+3.4[6]	+3.7[6]	+3.4[6]	+3.6[6]
Rolling	*−0.5*[5]	+0.6[3]	−1.1[4]	−0.7[6]	−0.4[6]	—	—	−2.0[6]	+0.9[6]
Intensive cultivation ..	*−0.3*[5]	−1.5[3]	+0.3[4]	−0.4[6]	−0.2[6]	−1.7[6]	+1.2[6]	—	—
St. errors ..	(1) ±0.546, (2) ±0.772, (3) ±0.891, (4) ±0.629, (5) ±0.514, (6) ±0.727.								

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Main effects and interactions of salt

Salt	No Dung	Dung	Ordinary rolling	Heavy rolling	Normal cultivation	Intensive cultivation	*Mean*	*Increase*
ROOTS (washed) : tons per acre ($\pm$0.245. *Means* : $\pm$*0.173. Increases* : $\pm$*0.245*)								
None	10.16	11.86	10.89	11.12	10.91	11.10	*11.01*	
Before ploughing	11.37	12.91	12.49	11.79	12.10	12.18	*12.14*	+*1.13*
Before sowing	11.34	11.79	11.66	11.47	11.33	11.81	*11.57*	+*0.56*
TOPS : tons per acre ($\pm$0.331. *Means* : $\pm$*0.234. Increases* : $\pm$*0.331*)								
None ..	9.73	9.99	10.00	9.71	9.97	9.75	*9.86*	
Before ploughing	9.08	10.16	9.97	9.27	9.60	9.64	*9.62*	−*0.24*
Before sowing	9.35	9.20	9.74	8.81	8.79	9.76	*9.28*	−*0.58*
SUGAR PERCENTAGE : ($\pm$0.105. *Means* : $\pm$*0.0742. Increases:* $\pm$*0.105*)								
None	16.95	16.92	16.83	17.04	16.95	16.92	*16.94*	
Before ploughing	17.12	17.10	17.05	17.17	17.02	17.20	*17.11*	+*0.17*
Before sowing	16.96	17.33	17.12	17.18	17.11	17.18	*17.15*	+*0.21*
TOTAL SUGAR : cwt. per acre								
None	34.4	40.1	36.6	37.9	37.0	37.6	*37.3*	
Before ploughing	38.9	44.2	42.6	40.5	41.2	41.9	*41.6*	+*4.3*
Before sowing	38.5	40.9	39.9	39.4	38.8	40.6	*39.7*	+*2.4*
PLANT NUMBER : thousands per acre ($\pm$0.629. *Means* : $\pm$*0.445. Increases* : $\pm$*0.629*)								
None ..	26.7	30.4	28.2	28.8	29.3	27.8	*28.5*	
Before ploughing	27.8	32.3	30.8	29.2	29.9	30.1	*30.0*	+*1.5*
Before sowing	28.5	30.9	30.0	29.4	29.4	30.0	*29.7*	+*1.2*

Conclusions

Salt produced significant increases in the yield of roots and the sugar percentage, and a small but not significant decrease in the yield of tops. The increase in total sugar was 3.3 cwt. per acre. The increase in roots was significantly greater when the salt was applied before winter ploughing than when it was applied at sowing. This effect, however, appeared only in presence of dung, the interaction between dung and time of application of salt being significant. Otherwise there was little difference in the effects of time of application.

Dung significantly increased the yield of roots, the resultant increase in total sugar being 4.4 cwt. per acre. The increases in tops and sugar percentage were not significant.

Additional heavy rolling gave a significant decrease in tops. There were no significant differences between the effects of ordinary and intensive inter-row cultivation.

Plant number was significantly increased by salt and dung.

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SUGAR BEET

Soil fumigation experiment. Effect of chlorpicrin, chlordinitrobenzene, "seekay" and "cymag," as controls of wireworm infestation.

RS—PASTURES, 1935
Plan and yields in lb.

Roots (dirty), tops, sugar percentage and plant number in descending order

103	P 217 298 15.72 439	O 284 330 15.92 442	N 359 440 15.38 474	K 148 178 14.83 424	M 488 532 16.01 512	107
108	M 466 494 15.49 514	K 146 152 15.69 440	O 434 402 16.47 520	N 431 448 16.27 504	P 450 439 16.48 507	
S ↑	O 460 434 16.13 511	M 522 522 16.93 515	K 165 202 15.26 464	P 555 378 16.53 523	N 516 546 15.95 495	
	N 476 486 16.01 500	P 464 418 16.30 498	M 546 542 16.39 476	O 500 476 16.13 464	K 179 196 15.20 439	
123	K 188 213 15.06 426	N 386 426 15.87 444	P 384 375 15.78 479	M 458 461 16.36 486	O 344 306 16.21 451	127

Note: In the field the plots lay in one line, 108 being next to 107, etc.

SYSTEM OF REPLICATION: 5 × 5 Latin square.

AREA OF EACH PLOT: 1/60 acre (60.6 lks. × 27.5 lks.).

TREATMENTS: No fumigant (O), chlordinitrobenzene (N) and chlorpicrin (P) at the rate of 2.0 cwt. per acre, "cymag" (M) at the rate of 7.5 cwt. per acre and "seekay" (K) at the rate of 5.0 cwt. per acre.

BASAL MANURING: 4 cwt. superphosphate, 2 cwt. muriate of potash and 1 cwt. sulphate of ammonia per acre.

CULTIVATIONS, ETC.: Ploughed: April 26. Fumigants applied as ploughed. Harrowed: April 30. Rolled: April 30. Seed sown: April 30. Harrowed: May 2. Rolled: May 2. Singled: June 15. Hoed: June 18, 29, July 25 and 26. Lifted: November 5-8. Variety: Kleinwanzleben. Previous crop: Grass.

STANDARD ERRORS PER PLOT: Roots (washed): 0.953 tons per acre or 9.91%. Tops: 1.08 tons per acre or 9.22% Sugar percentage: 0.290. Plant number: 1.18 thousands per acre or 4.11%. The "Seekay" treatment was omitted in the analysis of roots and tops, owing to its low yields. Mean dirt tare: 0.1785.

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Summary of Results

	No fumigant	Chlordinitrobenzene	Chlorpicrin	'Cymag'	'Seekay'	*Mean*	Standard Error
ROOTS (washed), tons per acre	8.90	9.54	9.11	10.91	3.64	*8.42*	±0.426*
TOPS, tons per acre ..	10.44	12.57	10.22	13.67	5.04	*10.39*	±0.519*
SUGAR PERCENTAGE ..	16.16	15.92	16.16	16.24	15.22	*15.94*	±0.130
TOTAL SUGAR, cwt. per acre	28.8	30.4	29.4	35.4	11.1	*27.0*	—
PLANT NUMBER, thousands per acre	28.6	29.0	29.4	30.0	26.3	*28.7*	±0.528

* These standard errors are not applicable to the " Seekay " treatment.

Conclusions : Yields

The yield of roots with "cymag" was significantly higher than that with chlorpicrin or chlordinitrobenzene, the latter yields not being significantly different from the yield with no fumigant. The response to " cymag " may be an effect of nitrogen, the dressing being equivalent to 87 lb. nitrogen per acre.

" Cymag " and chlordinitrobenzene significantly increased the yields of tops, the increases not being significantly different. There were no significant effects on sugar percentage, apart from the reduction due to " seekay."

" Seekay " gave low yields and a low sugar percentage. This was possibly because it was applied too near sowing date.

No relation was found between the yields of roots and the numbers of wireworms at the second count, after eliminating treatment effects.

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Wireworm Counts :

Plan and number of wireworms per plot (total of six samples)
1st count above, 2nd count below

103	**P** 6 6	**O** 6 3	**N** 20 29	**K** 34 8	**M** 19 17	107
	M 15 8	**K** 20 13	**O** 34 18	**N** 25 12	**P** 26 16	
S ↑	**O** 20 16	**M** 17 12	**K** 24 7	**P** 33 10	**N** 22 28	
	N 39 14	**P** 24 11	**M** 36 13	**O** 24 22	**K** 32 7	
123	**K** 26 7	**N** 22 26	**P** 35 24	**M** 29 14	**O** 19 20	127

Note: At the first count three random samples per half plot were taken; at the second count two per third of a plot. Each sample consisted of 9 ins. × 9 ins. × 4 ins. (deep) of soil.

STANDARD ERRORS PER PLOT: First count: sampling error: 6.06 or 25%; experimental error: 6.99 or 29%. Second count: sampling error: 4.87 or 34%; experimental error: 7.18 or 50%.

Summary of Results : Second Count

No. of wireworms per square yard, 4 inches deep

No fumigant	Chlordini-trobenzene	Chlor-picrin	"Cymag"	"Seekay"	*Mean*	Standard error.
42	58	36	34	22	*38*	±8.59

Conclusions : Wireworm Counts

The effects of the treatments on the numbers of wireworms were not significant. No relation was found between the numbers of wireworms per plot at the first and second counts, after allowing for possible treatment effects.

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BRUSSELS SPROUTS

Effect of sulphate of ammonia, poultry manure, soot and rape dust

FOSTER'S—RD, 1935
Plan and yields in lb. saleable sprouts
Total of both Pickings

1	R_1 37.0	N_2 22.5	M_2 13.5	M_1 26.5	M_0 34.5	R_1 29.0	R_0 37.5	N_1 32.5	8
	S_2 41.0	S_1 25.0	N_1 12.0	M_0 17.5	S_0 21.5	M_1 34.0	M_2 41.0	N_2 35.0	
SW ↑	R_0 27.5	S_0 15.5	R_2 25.0	N_0 17.0	R_2 41.0	S_2 36.5	N_0 44.5	S_1 26.0	
	R_0 26.0	N_2 15.5	M_1 17.0	S_1 30.0	R_0 21.5	R_2 27.0	R_1 25.5	M_1 30.0	
	N_0 17.0	M_2 20.0	M_0 23.5	S_0 19.5	M_0 23.5	N_2 28.0	N_1 30.0	S_2 30.5	
41	R_1 19.5	S_2 25.5	R_2 20.0	N_1 29.5	S_0 28.0	N_0 20.5	S_1 24.5	M_2 24.4*	48

* Estimated.

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each.

AREA OF EACH PLOT (after rejecting edge rows) : 0.024174 acre. Plots actually 10 yds. × 14 yds.

TREATMENTS : 1935. No nitrogen (O), sulphate of ammonia (N) half applied in seed bed and remainder as a top dressing, poultry manure (M), soot (S) and rape dust (R), applied at the rate of 0.4 cwt. N per acre (1) or 0.8 cwt. N per acre (2).
Plots receiving treatment O in 1935 had treatment 2 in 1934 and vice versa. Plots receiving treatment 1 had this in both years. For N_0, S_0, M_0 and R_0 (see plan), the treatment symbols refer to the 1934 treatment.

BASAL MANURING : All plots were made up to 1.0 cwt. P_2O_5 per acre. and 1.0 cwt. K_2O per acre, using superphosphate and muriate of potash (an allowance being made for the P_2O_5 and K_2O contained in the organic manures).

CULTIVATIONS, ETC. : Ploughed : Mar. 5 and 6. Harrowed : Mar. 16. Ploughed : Mar. 18-20. Harrowed : May 3. Rolled : May 3. Manures applied : May 22-29. Second half of sulphate of ammonia applied : July 27. Harrowed : May 28-29. Rolled : May 30. Brussels planted : June 5-6. Hoed : July 24, 30, 31 and Sept. 16. Harvested : First picking : Nov. 19-20. Second picking : Mar. 5. Previous crop : Brussels.

STANDARD ERROR PER PLOT (total of both pickings, saleable sprouts): 2.42 cwt. per acre or 24.8%.

SPECIAL NOTE : Owing to damage by pigeons the weights at the second picking were very small.

Saleable Sprouts—total of both pickings : cwt. per acre (±1.21)

Nitrogen, cwt. p.a. 1934	1935	Sulph. amm.	Poultry manure.	Soot.	Rape dust.	*Mean.* (±0.605)
0.8	0.0	9.1	9.1	7.8	10.4	*9.1*
0.4	0.4	9.6	9.9	9.7	10.2	*9.8*
0.0	0.8	9.3	9.1	12.3	10.4	*10.3*
Mean (±0.699)		*9.3*	*9.4*	*9.9*	*10.3*	*9.7*

Conclusions

The experiment is designed to measure the difference in the immediate and cumulative effects of certain organic fertilisers and sulphate of ammonia. The yield was a very poor one, owing to adverse weather conditions and damage by birds. There were no significant effects.

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BEANS

Effect of dung, nitrochalk, superphosphate and muriate of potash, and of spacing of the rows.

RE—Little Hoos, 1935.

Plan and yields in lb., grain above, straw below.

1	S_1NK 71.2 86.8	S_1 66.5 82.5	S_1P 56.7 68.3	S_1NPK 48.0 52.0	4
	S_2NP 45.7 57.3	S_2DN 70.5 93.0	S_2DNP 64.6 82.4	S_2N 23.3 25.7	
	S_1DP 76.7 95.3	S_2PK 74.3 84.7	S_1D 74.8 97.2	S_2K 39.3 41.2	
W ↑	S_2DK 73.3 86.7	S_1DNPK 77.0 112.5	S_1DNK 73.7 104.3	S_2DPK 56.3 71.7	
	S_2 36.2 40.3	S_2DP 49.8 65.2	S_1N 68.0 81.5	S_1K 63.6 68.9	
	S_2NK 60.5 62.5	S_1DK 51.3 73.2	S_2DNK 92.5 114.5	S_1DPK 63.6 82.9	
	S_1NP 36.3 48.7	S_2DNPK 61.3 82.2	S_2P 29.9 39.1	S_1DNP 60.8 80.7	
29	S_1DN 67.3 88.2	S_1PK 49.6 57.9	S_2D 54.7 69.3	S_2NPK 47.9 60.1	32

SYSTEM OF REPLICATION : 4 randomised blocks of 8 plots each. Certain interactions confounded with block differences. Error estimated from high order interactions.

AREA OF EACH PLOT : 1/40 acre (68.7 lks. × 36. 4 lks.)

TREATMENTS : All combinations of :

Spacing { 18 ins. (S_1) / 24 ins. (S_2) } × Dung { None / 10 tons (D) } × Nitro-chalk { None / 0.4 cwt.N (N) } × Superphosphate { None / 0. 6 cwt. P_2O_5 (P) }

× Muriate of Potash { None / 1.0 cwt. K_2O (K) }

CULTIVATIONS : Dung applied : Oct. 10. Ploughed : Oct. 10-17. Artificials applied : Oct. 20. Harrowed : Oct. 22. Drilled : Oct. 22. Harrowed : Oct. 24 and Mar. 20. Nitro-chalk applied : Mar. 28. Hand hoed : May 1-7. Harvested : Aug. 6. Previous crop : Wheat.

STANDARD ERRORS PER PLOT : Grain : 3.38 cwt. per acre or 16.1%. Straw : 3.57 cwt. per acre or 13.6%.

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Responses to fertilisers : cwt. per acre.

Mean yields : Grain : 21·0 cwt. ; Straw : 26·3 cwt.

Treatment	*Mean response*	Differential responses									
		Spacing		Dung		Nitro-chalk		Super-phosphate		Muriate of Potash	
		18 ins.	24 ins.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
GRAIN : (±1.69. *Mean response :* ±1.20)											
Spacing 18 ins. —24 ins.	*+2.8*	—	—	+4.6	+1.0	+4.0	+1.6	+3.8	+1.7	+5.9	−0.3
Dung ..	*+5.6*	+3.8	+7.4	—	—	+3.8	+7.4	+5.8	+5.4	+7.0	+4.2
Nitro-chalk ..	*+1.2*	0.0	+2.4	−0.7	+3.0	—	—	+3.0	−0.7	−0.4	+2.7
Super-phosphate	*−2.0*	−3.0	−0.9	−1.8	−2.1	−0.1	−3.8	—	—	−1.8	−2.1
Muriate of potash ..	*+2.7*	−0.4	+5.8	+4.1	+1.3	+1.2	+4.2	+2.8	+2.6	—	—
STRAW : (±1.78. *Mean response :* ±1.26)											
Spacing 18 ins. —24 ins.	*+4.6*	—	—	+6.1	+3.1	+5.7	+3.4	+6.6	+2.5	+7.6	+1.6
Dung ..	*+9.8*	+8.4	+11.3	—	—	+7.1	+12.6	+10.6	+9.1	+10.2	+9.5
Nitro-chalk ..	*+2.4*	+1.3	+3.5	−0.4	+5.2	—	—	+4.3	+0.5	0.0	+4.8
Super-phosphate	*−1.7*	−3.8	+0.4	−0.9	−2.4	+0.2	−3.6	—	—	−1.8	−1.5
Muriate of potash ..	*+2.8*	−0.2	+5.8	+3.1	+2.5	+0.4	+5.2	+2.7	+3.0	—	—

Interaction of spacing and muriate of potash.

Spacing	GRAIN : cwt. per acre Muriate of potash		STRAW : cwt. per acre Muriate of potash	
	None	1.0 cwt. K_2O	None	1.0 cwt. K_2O
18 inches ..	22.6	22.2	28.7	28.5
24 inches ..	16.7	22.6	21.1	26.9

STANDARD ERRORS : Grain : ±1.20. Straw : ±1.26.

Conclusions

The 18-inch spacing gave significantly higher yields of both grain and straw than the 24-inch spacing. The responses to dung were both significant, that for grain being 5.6 cwt. per acre or 26.7 per cent. of the mean yield. The increases due to nitro-chalk were not significant. Superphosphate produced slight, though not significant, decreases in yield. The response to muriate of potash was significant in the case of grain and almost significant in the case of straw. This effect, however, appeared only with the 24-inch spacing, the interaction between muriate of potash and spacing being significant for both grain and straw.

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